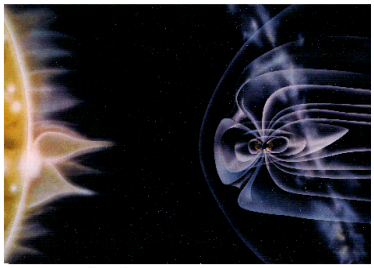
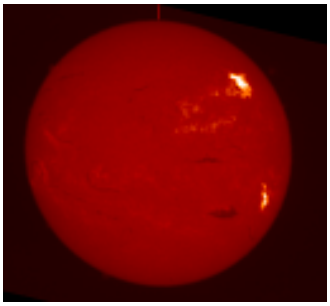
noaaresearch

Space Environment Center

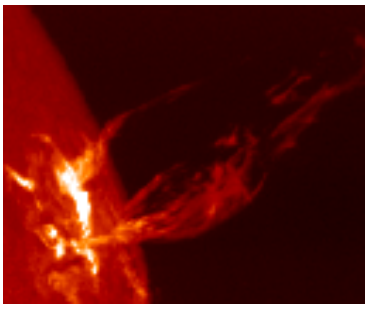
Space Weather services and research



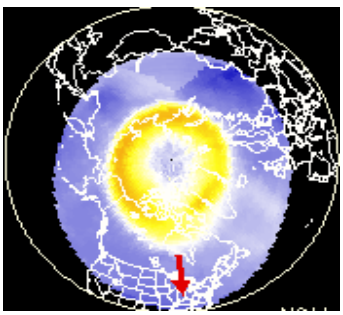
Solar events cause space weather



Two flaring regions on the sun



A solar flare with eruptive prominence near the limb of the sun



Satellite image of aurora

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What does the Space Environment Center do for the nation?

TheThe Space Environment Center (SEThe Space Environment Center (SEC) is tTh weatherweather alerts and wweather alerts and warnweather alerts and warnings. S spacespace environment; provides accurate, reliablspace environment; provides information;information; and leads programs tinformation; and leads programs to info into phenomena affectinginto phenomena affecting the Sun-Earth environment, includi electromagneticelectromagnetic radiation and particles from the Sun, the transmission energyenergy to Earth venergy to Earth via senergy to Earth via solar wind, and the in Earth's magnetic field, ionosphere, and atmosphere.

TheThe role of the SThe role of the SpThe role of the Space Environment Center is describedescribe the space environmdescribe the space environmentdescribe th conditions,conditions, and to create forecasts of futureconditions, and to create foreca warnwarningswarnings and alerts are issued for systems operators who may be adv affected byaffected by space weather storms. These user groups areaffected by space government,government, and military operatgovernment, and military operators, cgov high-frequencyhigh-frequency radio communications, satellitehigh-frequency radio com radio navigation, and national security.

Recent Accomplishments:

" ApproximatelyApproximately two years ago, introduced physics-basedApproximately thethe first time,the first time, into the operational space weatherthe first time, into the o ththesthesethese university-developed models only when realtime solar wind data upstreamupstream of Earth became available to drive them. upstream of Earth becam ***getget get numerical guidance, much as meteorological forecasters do. Aget numericalnumerical models suggest paths for improvements in thenumerical leadlead times of forecasts. Finally, model output can be dlead times of fore provideprovide customers with the space weather analogs of meteorologica weatherweather maps, showing event locations and intensities ofweather fronts and boundaries.***

" DevelDevelopedDeveloped parDeveloped partnerships to bring to Boulder, put to disseminatedisseminate viadisseminate via the World Wide Web data obtained with se researchresearch spacresearch spacecraftresearch spacecraft. Won a reinventin ViceVice President Gore for thVice President Gore for this work.Vice President Go costcost to NOAA,cost to NOAA, from Japan, United Kingdom, India, France, the U.S andand NASA to keep a contand NASA to keep a continuouand NASA to keep a c fromfrom theifrom their tfrom their tracking stations around the world, then using the thethe data cheaply to Boulder. ***Payoffs: Very inexpensively,Payoffs: Very in availableavailable to aid favailable to aid foavailable to aid forecasters, to dri informinform the public (including the NASA experimenters) immediately.inform thethe huge expense of the research satellites brings added benefithe hug taxpataxpayerstaxpayers because the data improve specification and foreca space environment.***

" ImprovedImproved a Web site to get space weatImproved a Web site to get spa ***Payoffs:Payoffs: Information is conveyed, quickly, accurately, and cheaply to multitudemultitude of users. (There were aboutmultitude of users. (There wer WebWeb site during each of two consecutive 24-hour periods during Web si andand geomagnetic activity in July and geomagnetic activity in Ju representativesrepresentatives can find on the site much valuable informa explanations of space weather physics and effects, in addition to data.***

What s Next for SEC?

Science Challenges in the next 5-10 years:

" ImprovingImproving andImproving and assimilating data, distributed in space and time,Improving and assimilatin ofof the biggest challenges, asof the biggest challenges, as it has beenof the biggest challenges, as it has been combinescombines computational science and physical understanding ofcombines computational science and p totto imto improvementto improvements in both. With successful 4-D data assimilation , the model outputs weatherweather maps willweather maps will beweather maps will be more accurate and more skillful, therefo

" AA solar x-ray imager, to be launched on GOES-M in 2001, and funded as a USAF-NASA-NOAA partnership,partnership, will provide images ofpartnership, will provide images of the solar corona at a rate of one fromfrom its less-capable predecessors implies that visible coronal changes will signal events on the Sun whichwhich will later cause space weather storms and may signalwhich will later cause space weather storms and thethe extraction of information from these imathe extraction of information from these images and dthe extra intointo specification and forecastinto specification and forecast algorithms is a rich challenge which will shed ligh processes responsible for the solar wind and eruption events hazarding Earth.

Research Partnerships:

SECSEC works closelySEC works closely with colleagues in universities andSEC works closely with colleagues in uni totto understand the space environment and to capture that understanding in physics-based numerical models.models. The seven-agency National Space Weather Program s Implementation Plan (revised in 2000) sets out the expected data, research, and services contribution from each participating agency.

CooperativeCooperative ventures abound in SEC as graduate students, post-doctoral stCooperative ventures ab CooperativeCooperative Institute fellows from the University of Colorado, and contractors allCooperative Institute fel thethe Center. Athe Center. Additionally, SEC works with the Cooperative Institute for Research in Enviro Sciences, a NOAA joint institute.

Services Partnerships:

ToTo provide its specification and forecast services, SEC works most closely withTo provide its specification and forec Agency sAgency s forecast centers in Colorado Springs and Omaha, which provide services to U.S. military customers.customers. NOAA civilians and uniformed NOAcustomers. NOAA civilians and uniformed NOAA C SEC sSEC s Space Weather Operations. SESEC s Space Weather Operations. SEC has one SEC s Spa Agreement,Agreement, with Federal Data Corporation (FDC), to develop a model of the wavelength-dependen changingchanging solar brightness, for customers interested inchanging solar brightness, for customers interested atmosphere.

Budget and Staff:

SECSEC is a $6 million lab ($5.4 million in NOAA base) with 65 employees, including federal, university, and contractcontract employees. SECcontract employees. SEC is also onecontract employees. SEC is als Environmental Prediction.

For more information, contact:

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